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Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

Claims 1-12 (Canceled)

13. (New) Method of controlling an accelerator coupled nuclear system (ACS) comprising a nuclear reactor, having a core, the nuclear reactor, operating in subcritical mode, and a neutron generator device using a beam of accelerated charged particles, the neutron generator consuming a predetermined amount of energy E_p^{nom} produced by the core in order to produce a number of external neutrons for maintaining a nuclear chain reaction in the core, and an operating point of the system being selected at a nominal charged particle energy E_p^{nom} close to an optimal energy value E_p^{max} for which a relationship between the number of external neutrons produced and an energy of a beam of the charged particles used by the neutron generator device to produce the neutrons is maximum, the method comprising the steps of, for a self-regulated and reliable operation of the coupled system selecting the nominal particle energy E_p^{nom} to be greater than the optimal energy value E_p^{max} , and adjusting the number of external neutrons depending on operating power fluctuations of the nuclear reactor by acting on the energy of the charged particles (E_p) generated and accelerated by the accelerator.

14. (New) Method of controlling an accelerator coupled nuclear system (ACS) in accordance with claim 13, wherein the operating point of the system is determined by the nominal particle energy E_p^{nom} being equal to a sum of the optimal energy E_p^{max} and an energy ΔE_p selected so as to be greater than possible negative fluctuations of the charged particle energy in response to the negative fluctuations of the power of the reactor in the normal operating mode of the reactor.

15. (New) Method of controlling an accelerator coupled nuclear system (ACS) in accordance with claim 13, characterized in that it comprises the following steps:

1. determining operating conditions under which the nuclear reactor is to be operated including: level of subcriticality (r_0), consumable power to be produced, thermal power P_{th} or electric power $P_{el} = \eta_{el} P_{th}$ where η_{el} is the electric yield of the plant, quantity and kind of fuel,

2. from the determined operating conditions, determining operating parameters of the accelerator as follows:

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a - determining the optimal energy E_p^{Max} of the charged particles, which verifies the expression:

$$d/dE_p [\varphi^*(E_p)\eta_a(E_p)Y_n(E_p)/E_p] = 0 \quad (1)$$

in which E_p is the energy of the charged particles, Y_n is the neutron yield, φ^* is the neutron importance, and η_a is the yield of the accelerator,

b - selecting the nominal energy E_p^{nom} to be equal to or greater than the optimal energy E_p^{Max} :

$$E_p^{nom} = E_p^{Max} + \Delta E_p, \Delta E_p > 0. \quad (2)$$

c - determining a nominal intensity I_p^{nom} of the beam of charged particles necessary to obtain a nominal power of the reactor P_{th}^{nom} depending on a nominal energy E_p^{nom} , on the neutron yield $Y_n(E_p^{nom})$, on the yield of the accelerator $\eta_a(E_p^{nom})$, on the average number ν of fission neutrons, on the energy E_{fis} supplied in a fission reaction, and on the neutron importance $\varphi^*(E_p^{nom})$ for the nominal energy E_p^{nom} according to the equation:

$$I_p^{nom} = r_0 \nu P_{th}^{nom} / [E_{fis} \varphi^*(E_p^{nom}) Y_n(E_p^{nom})], \quad (3)$$

as well as the amount of energy produced by the reactor that is consumed by the accelerator according to the equation:

$$P^{nom} = E_p^{nom} r_0 \nu / [E_{fis} \varphi^*(E_p^{nom}) Y_n(E_p^{nom}) \eta_a(E_p^{nom}) \eta_{el}], \quad (4)$$

3. setting the amount of energy produced by the reactor that can be consumed by the accelerator as a fraction f of the total energy produced by the reactor, as well as the intensity of the charged particle beam at nominal values according to the following formulas:

$$I_p^{nom} = r_0 \nu P_{th}^{nom} / [E_{fis} \varphi^*(E_p^{nom}) Y_n(E_p^{nom})], \quad (3)$$

$$P^{nom} = E_p^{nom} r_0 \nu / [E_{fis} \varphi^*(E_p^{nom}) Y_n(E_p^{nom}) \eta_a(E_p^{nom}) \eta_{el}], \quad (4)$$

4. adjusting the number of external neutrons acting on the particle energy E_p with constant beam intensity, depending on the operating power fluctuations of the nuclear reactor, according to an expression that defines the fluctuation of the energy:

$$E_p = P^{nom} P_{el} \eta_a(E_p) / I_p^{nom} \quad (5)$$

16. (New) Method of controlling an accelerator coupled nuclear system in accordance with any of the above claims, in which the charged particles are protons, and the neutron-generating nuclear reaction is a spallation reaction.

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17. (New) Method of controlling an accelerator coupled nuclear system in accordance with claim 16, in which the spallation target is made of lead-bismuth, and the optimal proton energy E_p^{max} ranges from 0.5 GeV to 2.5 GeV.

18. (New) Method of controlling an accelerator coupled nuclear system in accordance with any of the claims 13 through 15, in which the charged particles are electrons, and the neutron-generating nuclear reaction is a photonuclear reaction.

19. (New) Accelerator coupled nuclear system comprising a nuclear reactor, having a core, operating in subcritical mode and a neutron generator device using a beam of accelerated charged particles, the neutron generator consuming a predetermined amount of energy E^{nom} produced by the core in order to produce a number of external neutrons for maintaining a nuclear chain reaction in the core, and an operating point of the system being selected at a particle energy value E_p^{nom} close to an optimal energy value E_p^{max} for which a relationship between the number of external neutrons produced and an energy of the charged particle beam used to produce the neutrons is maximum, the system comprising, for a self-regulated and reliable operation, it comprises means for selecting the nominal particle energy E_p^{nom} to be greater than the optimal energy value E_p^{max} , and, adjusting the number of external neutrons depending on operating power fluctuations of the nuclear reactor by acting on the energy of the charged particles (E_p) generated and accelerated by the accelerator.

20. (New) System in accordance with claim 19, further comprising means for determining the operating point of this system by a nominal particle energy E_p^{nom} equal to a sum of the optimal energy E_p^{max} and an energy ΔE_p selected so as to be much greater than possible negative fluctuations of the charged particle energy in response to the negative fluctuations of the power of the reactor in the normal operating mode of the reactor.

21. (New) Accelerator coupled nuclear system in accordance with claim 19 or 20, wherein the charged particles are protons directed in a beam at a central part of the core, and the core comprises a spallation target.

22. (New) Accelerator coupled nuclear system in accordance with claim 21, in which the spallation target is surrounded by a buffer, having a conversion yield that is less than half of a conversion yield of the spallation target.

23. (New) Accelerator coupled nuclear system in accordance with claim 19 or 20, comprising a target for producing the neutrons in response to the charged particles, the

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target having an optimized geometry which increases losses of the charged particles in this target.